The Atom and the Periodic Table

Atomic Number: the number of protons. It's what makes that element that element. The number of protons determines the element.

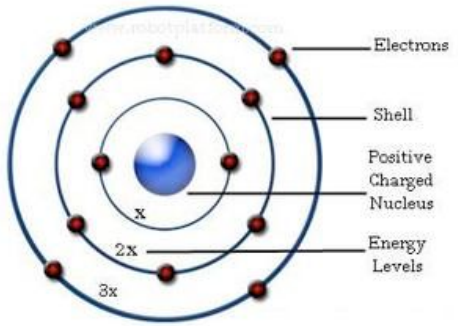
-Mass Number: the mass of a given atom, it's protons and neutrons, because electrons have a negligible mass (must be a whole number).

Isotopes: Atoms of the same element with different masses or atoms with the same number of protons with different numbers of neutrons.

Atomic Mass: a weighted average of all-natural isotopes of an element. You must round atomic mass to the nearest 10th.

Atomic mass = (exact mass of isotope #1)(abundance) + (exact mass of isotope #2)(abundance) + …

Electron Configurations: (e- configurations) found on the bottom left.



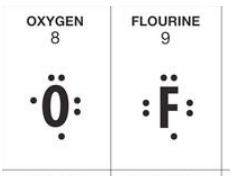
The Neils Bohr Model of the Atom:
Electrons are organized on rings called principal energy levels. The electrons cannot exist between the rings. Not 100% accurate, but it was revolutionary because Neils Bohr started quantum theory (each ring creates a specific quantity of energy).

Excited state: electrons jump from inside to outside, never over the maximum.

Maximum number of electrons per shell = 2n squared

n	2n squared	max e-
1	2(1) squared	2
2	2(2) squared	8
3	2(3) squared	18
4	2(4) squared	32

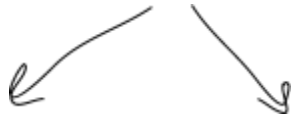
Light Spectra: ground state to excited state, energy is absorbed, the electron moves outward. Then, it falls back to its original location, energy is released, excited state to ground state produces a light spectrum.



Lewis Dot Diagrams: determine the number of valence electrons of the element, write down the chemical symbol of the element, draw the first two dots around one side, continue drawing dots of the rest of the valence electrons, first filling each side with one electron, valence electrons: the electrons in the outside right of the principal energy level.

An ion: when an atom becomes an ion, it either gains or loses electrons. Definition: changed particle. 2 types: positive - cation negative - anion

Neutral Atoms



Loss of electrons Gain of electrons

Cation (+) Anion (-)

Groups: the vertical columns of the periodic table have the same number of valence electrons. Elements in the same group have similar chemical properties.

Group 1 - alkali metals

Group 2 - alkaline earth metals

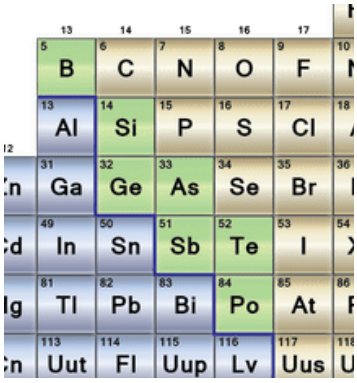
Group 3-12 - transition metals

Group 17 - halogens

Group 18 - noble gases

Periods: the horizontal rows of the periodic table. Elements in the same period have the same number of principal energy levels (rings in a Bohr Model)

Dimitri Mendeleev - created the first periodic table



Metalloids: show characteristics of both metals and nonmetals: boron (B), silicon (Si), arsenic (As), tellurium (Te), astatine (At), germanium (Ge), antimony (Sb)

Characteristics of metals and nonmetals:

Metals	**Nonmetals**
Metallic luster or shine	Lack of metallic luster
Good conductor of electricity and heat	Poor conductor of electricity and heat
Ductile - can be shaped into wires	Solids are brittle - break down into powder
Malleable (can be flattened into sheets)	Low melting and boiling points
High melting and boiling points	Gain electrons when they react
Lose electrons when they react	
React to oxygen	

Transition metals: (groups 3-12) as ions produce a characteristic color

Ionization energy: the amount of energy needed to remove the outermost electron. Metals with low IE are reactive, nonmetals with high electronegativity are reactive
Strongest attraction = atoms with the highest EN
Low ionization = least amount of energy
From left to right, IE and EN increase, from up to down, they decrease
Electronegativity: a scale from 0-4 that measures the ability of an atom to gain or attract electrons.
Atomic radius: the size of an atom. Atomic radius decreases from left to right and increases from up to down
Allotropes: substances made of the same element but with different compositions of different structures, allotropes have different physical or chemical properties